The Growth and Yield of Five High-Yield Rice Varieties Following Integrated Farming Rice-Duck Treatments

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ABSTRACT

One of integrated farming systems that can be developed is rice-ducks. Integrated farming rice-duck allows farmers not only get rice but also get the duck meat and eggs in the same land. This study aims to evaluate the growth and production of some high-yielding rice seed that were applied to the rice-duck farming. The research was conducted in Musi Rawas District South Sumatra Province, Indonesia 90 meters above sea level from May to August 2015. This study used experiment with split plot design, 3 replications. There are two treatments namely ducks as the main plots and rice varieties as a subplot namely Inpari 22, Mekongga, Ciherang, Inpara 3, and Inpari 31. Variables that observed were height plant, number of tillers, panicle numbers, production per clump, production per hill, number of grains per panicle, weight of 1000 grains. The results showed that treatment of ducks very significant affects on the number of grains per panicle, 1000 grain weight and no significant effect on other parameters. The varieties very significant on plant height, number of grains per panicle, weight of 1000 grains significantly affect the number of panicles, production per hill of plant and no affect other parameters. Combination treatment Inpari ducks and inpari 22 is the highest production.

Key words: integrated farming, rice-duck, rice varieties.

INTRODUCTION

Modern farming requires high external inputs such as chemical fertilizers and pesticides to produce maximal production. It may caused pollution and environmental damage. To overcome this problem can be developed one of the concepts of sustainable agriculture namely integrated farming (Mason, 2004).Integrated farming is a mix of agricultural activities that support sustainable agriculture by involving plants and animals in the same area. The main objective of the integrated farming is to reduce the external inputs because of the mutual support between onecomponentto the other components. Some advantages of integrated farming is the increament of efficiency and land productivity, resulting diversification product, improve soil fertility, improve the physical properties of the soil, reduce weeds, pests and diseases (Barroga, Gicana and Barroga, 2007; Wang *et al.*, 2003).Presence of duck in a rice field causes increasing growth and production of rice (Mofidian and Sadeghi, 2015).

One of the integrated farming may be developed in some countries is the system of rice and ducks. Integrated farming between rice and duck allows farmers not only get rice but also duck meat and eggs in the same land. livestock manure into a source of nutrients for the rice crop (Hossain *et al.*, 2005). Goh, Song and Manda (2001), the population density of ducks in rice paddy fields can reach 1000 to 1500 birds per hectare. With this system, it can increase rice production reached 20 percent compared to rice cultivation without ducks. In addition, research on the system of rice duck is still limited in Indonesia so it needs to be studied more deeply.

MATERIALS AND METHODS

The research was conducted on irrigated land Tugumulyo subdistrict, Musi Rawas district, South Sumatera Province, Indonesia. The location of the research is located at 90 m above sea level and was carried out from May 2015 through September 2015. The research used experimental design ofsplit plot design with two treatments (Gomes and Gomes, 1984). The first treatment is integrated farming (P) as mainplot namely Po without duck (control) and P1 used duck and the second treatment is rice varieties (V) as subplots namely Inpari 31 (V1), Mekongga (V2), Ciherang (V3),Inpara 3 (V4)

and Inpari 22 (V5). All experiment treatments consist of 10 treatment combinations with three replications or blocks of experiment. The total number of units of plot were 30. Each experiment main plot has 5 m x 9,5 m and each plot has 1,5 m x 5 m. The distance between blocks are 1 m and between plots are 0,5 m. Spacing of rice used 25 x 25 cm.

Land preparation includes land clearing,soil tillage used tractor and then treated with organic matter dosage 5 ton/ha and the land divided by six main plots, each main plots there were five subplots. Seeds of five varieties soaked in water for 24 hours and then drained until the seeds germinate. The nursery was done on plastic trays, seedbeds media consisting of soil and organic fertilizer with a ratio of 1: 1. Seeds that had germinated moved into seedling media. The seven days seedling transplanted to field.

One seedling was planted in one hole. After 10 days old rice seedlings, the 15 days age of duckwere released, each main plot there were 8 ducks for the first 7 days of duck was released for 3 hours, then released on whole day. The ducks removed from the field when the rice begin flowering stage. No fertilizer and pestiside aplications in this study. Rice was harvested when the plants were between 95-115 days after planting appropriate varieties, with the characteristics of grain and flag leaf yellowing, rice 90% already yellow.

The parameters of plant growth and production were observedconsisting of plant height, number of tiller per hill of plant, number of panicle per hill of plants, weight of grain per hill of plant, number of productive grain per panicles, weight of 1000 grains and production per plot of experiment. The data from research were analyzed by using Analyses of Variance (ANOVA) followed by different test between treatments using the Honestly Significant Difference test (HSD).

RESULTS AND DISCUSSION

The result of the research showed that the ducks (I) very significant effect on grains per panicle, 1000 grain weight and no significant affect on plant height, number of tillers, number of panicles, perumpun production, production per plot. While varieties (V) very significant affect on plant height, number of grains per panicle, weight of 1000 grains, significantly affect the number and production of panicles per hill and no real effect on the number of tillers and production per plot. While both treatments interaction (IV) does notinfluence significantly on all the observed variables.

Plant Height

The treatment of duckdoes notaffect on plant height, the treatment used duck give the highest of height plant namely 120.27 cm. Ricevarieties very significant affects on plant height, the highest on inpara 4 variety give 130.80 cmand the interaction ducks and varieties does notaffects on plant height, the highest combination on inpara 4 variety and duck treatment (Table 1).

Tabel 1. Effect of duck (I), varieties (V) dan both interaction (IV) on plant height (cm)

Duck (I)	Varieties (V)					Means
	V1	V2	V3	V4	V5	I
I0	113.40	115.33	119.20	129.87	112.53	118.07
I1	114.67	120.20	121.13	131.73	113.60	120.27
Means V	114.04abA	117.77bcAB	120.17cB	130.80dC	113.07aA	

Means followed by the same alphabets within a column and row are not significantly different.

Number of Tiller

Duck treatment does not influence number of tiller, duck treatment give the highest number of tiller with 22.64 tillers. The rice varieties does not influence the number of tillerdan interaction duck and varieties (IV) not influence the number of tiller (Table 2) .

Table 2. Effect of duck (I), varieties (V) dan both interaction (IV) on number of tiller

Duck (I)	Varieties (V)					Means
	V1	V2	V3	V4	V5	I
I0	22.40	20.13	19.20	22.73	21.93	21.28
I1	22.67	21.47	20.87	21.17	27.00	22.64
Means V	22.54	20.80	20.04	21.95	24.47	

Number of Panicle.

The treatment of duck doesnot influence on number of panicle, the highest number on duck treatment give 20.56 panicles. Rice varieties influence significantly on number of panicles, the highest number on inpari 22 give 23.50 panicles. The interaction duck and varieties does not influence significantly on number of panicles (Table 3).

Table 3. Effect of duck (I), varieties (V) dan both interaction (IV) on number of panicle

Duck (I)	Rice Varieties (V)					Means
	V1	V2	V3	V4	V5	I
I0	20.27	17.20	16.73	20.80	21.73	19.35
I1	21.47	18.27	18.47	19.30	25.27	20.56
Means V	20.87 [ab]	17.74 [a]	17.60 [a]	20.05ab	23.50[b]	

Means followed by the same alphabets within a row are not significantly different at level 5%.

Production per Hill of Plant

Duck treatment does not influence the production per hill of plant, the highest on duck treatment give 99,06 g. Rice varietiesinfluence significantly on production per hill of plant, the highest on inpara 3 give 111,41 g. The interaction duck and rice varieties does not influnce the production per hill of plant (Table 4).

Tabel 4. Effect of duck (I), varieties (V) dan both interaction (IV) on production per hill of plant

Duck (I)	Varieties (V)					Means
	V1	V2	V3	V4	V5	I
I0	104.36	89.77	87.64	109.71	92.93	96.88
I1	96.25	96.51	89.47	113.11	99.95	99.06
means V	100.31 [ab]	93.14 [a]	88.56 [a]	111.41 [b]	96.44 a	

Means followed by the same alphabets within a row are not significantly different at level 5%.

Production per Plot

The treatment of duck does not influence the production per plot, the highest on duck teratment give 5.08 kg. Rice varieties does not influnce significantly on production per plot and interaction duck treatment and rice varieties also does not influence the production per plot (Table 6).

Tabel 6. Effect of duck (I), varieties (V) dan both interaction (IV) to production per plot

Duck (I)	Rice Varieties (V)					Means
	V1	V2	V3	V4	V5	I
I0	4.70	4.07	3.90	4.87	4.17	4.34
I1	4.33	4.33	4.03	5.10	7.63	5.08
Means V	4.52	4.20	3.97	4.99	5.90	

Number of Grain per Panicle

The treatment of duck does not influence the number of grain per panicle, the highest on duck treatmnet give 200 grains per panicle. Rice varieties influence very significantly on number of grain per panicle, the highest on inpara 3 variety give 263,30 grains per panicle while the interaction between duck and rice varieties did not influence the number of grain per panicle (Table 6).

Table 6. Effect of duck (I), rice varieties (V) dan both interaction (IV) onnumber of grain per panicle.

Duck (I)	Rice Varieties (V)					Means
	V1	V2	V3	V4	V5	I
I0	142.73	152.93	176.4	252.80	175.07	179.99^{aA}
I1	147.13	170.20	89.47	273.80	233.73	200.01^{bB}
Means V	144.93 aA	161.57 abA	175.80 bAB	263.30 dC	204.40 cB	

Means followed by the same alphabets within a row are not significantly different at level 5% and 1%

Weight of 1000 Grains

The treatment of duck does not influence the weight of 1000 grain, the highest on duck treatment give 27.41 g and rice varietiesinfluence very significantly to weight of 1000 grains, the highest on inpari 22 give 27.70 g, and interaction of duck treatment and rice varieties (IV) does not influence the weight of 1000 grains (Table 7).

Table7. Effect of duck (I), varieties (V) dan both interaction (IV) to weightof 1000 grains

Duck (I)	Varieties (V)					Means
	V1	V2	V3	V4	V5	I
I0	24.30	27.33	27.97	25.37	27.33	26.46 ^{aA}
I1	25.70	28.00	28.80	26.50	28.07	27.41 ^{bB}
Means V	25.00^{aA}	27.67^{cdC}	28.39^{eC}	25.94^{bB}	27.70^{dC}	

Means followed by the same alphabets within a row are not significantly different at level 5% and 1%

Results of analysis of variance showed that the treatment ducks very significantlyaffect on the number of grains per panicle and weight of 1000 grains. This means that there is a difference between the quality of panicles between the two treatments. This condition occurs because treatment with duck may improve the physical soil properties, add the organic into the soil through their manure, helps control weeds and pests in rice plants. Major pest was found in the rice field include rice planthopers, *Pila ampullacea*, and rice stem borer. Duck treatment give reduction the pest significantly in the site. Long *et al*., (2013), two approaches effect of rice duck namely (1) the direct approah where the duck as predator for the pest and their eggs and (2) the indirect approach where the duck disrupting the conducive of pest living and also the duck improves the ecological of rice plant, damage the ling condition of pest.

Analysis of variance showed that the treatment ducks no significant effect on plant height, number of tillers, number of panicles, production per hill of plant and production per plot but all parameters were observed show that the higher numbers on duck treatment. Duck treatmentlasted 45 days namely one week after planting to rice entering the generative period. These conditions cause the difference between the two treatments no significantly. According Hossain *et al*., (2003); Prasetyo *et al*., (2010); Mofidian and Sadeghi (2015), states that the agricultural system of integrated rice-duck is very advantageous because ducks can obtain food from living things around rice plants otherwise the rice can be grown successfully as free from interference of weeds, pests, and can improve the soil physical properties and chemistry of dirt and duck activity.

Based on the analysis of treatment of rice varieties (V) very significant effect on plant height, grain per panicle and 1000 grain weight. Treatment varieties highly significant on plant height, number

of grains per panicle and 1000 grain weight because it is caused genetically difference. Based on the description show that the production of five high yield rice varieties including inpari 31, mekongga, ciherang, inpara 3 and inpari 22 namely 8.5 ton/ha, 6.0 ton/ha, 5-7 ton/ha, 5-6 ton/ha and 7.9 ton/ha respectively (Suprihatno *et al*., 2007). The result of the result show that the production of high yield rice varieties including inpari 31, mekongga, ciherang, inpara 3 and inpari 22 namely 6.03 ton/ha, 5.6 ton/ha, 5.29 ton/ha, 6.65 ton/ha and 7.86 ton/ha respectively.The result of the research show that all production of five high yield rice varieties still below the description production. It was causedthe research did not use fertilizer or applied organic farming concept. The best growth and production among the five high yield rice was inpari 22 because the production nearly reach the description.

CONCLUSION

The result of the research showed that treatment of ducks very significant affects on the number of grains per panicle, 1000 grain weight and no significant effect on other parameters, but all parameter show the better growth and production on duck treatment. Rice-duck could be applied on all varieties includingInpari 22, Mekongga, Ciherang, Inpara 3, and Inpari 31.

ACKNOWLEDGEMENT

Holidi and Etty Safriyanisincerely appreciates the Indonesian Directorate General of Higher Education (DIKTI) for the financial support granted based on Research of Young Lecturer and Musi Rawas University.

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